



# **Air Monitoring Quality Assurance Plan**

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February 1999



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## **Air Quality Program**

Prepared by:

Washington State Department of Ecology  
Air Quality Program

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# 1 QA Plan Identification and Approval

Title: Air Monitoring Quality Assurance Plan for the State of Washington Department of Ecology Air Quality Program

The Air Monitoring Quality Assurance Plan for the Air Quality Program is hereby recommended for approval and commits the Program to follow the elements described within.

Washington State Department of Ecology

_____	Date: _____
Mary Burg, Air Quality Program Manager	

_____	Date: _____
Richard Siddoway, Air Monitoring Coordinator	

_____	Date: _____
Stan Rauh, Quality Assurance Coordinator	

EPA Region 10

_____	Date: _____
Barry Towns, Quality Assurance Manager	

_____	Date: _____
Ed Jones, Air Program Oversight Manager	

## **2 Distribution**

A copy of the Washington State Department of Ecology Air Monitoring Quality Assurance Plan and Procedures is distributed to all Air Quality Program management, air monitoring station operators, data management staff, and local air pollution control authorities and their appropriate staff.

## **3 Organization and Responsibilities**

### **3.1 Roles and Responsibilities**

Federal, State and local agencies have important roles in developing and implementing satisfactory air monitoring programs. As part of the planning effort, EPA is responsible for developing National Ambient Air Quality Standards (NAAQS), defining the quality of the data necessary to make comparisons to the NAAQS, and identifying a minimum set of quality control (QC) samples from which to judge data quality. The State and local organizations are responsible for taking this information and developing and implementing a quality system that will meet the data quality requirements. Then, it is the responsibility of both EPA and the State and local organizations to assess the quality of the data and take corrective action when appropriate. The responsibilities of each organization follow.

### **3.2 Washington State Department of Ecology**

40 CFR Part 58 defines a State Agency as “the air pollution control agency primarily responsible for the development and implementation of a plan (SIP) under the Clean Air Act (CAA)”. Section 302 of the CAA provides a more detailed description of the air pollution control agency.

The major responsibility of State and local agencies is the implementation of a monitoring program, which includes the implementation of an appropriate quality assurance program. It is the responsibility of State and local agencies to implement quality assurance programs in all phases of the environmental data operation, including the field, their own laboratories, and in any consulting and contractor laboratories which they may use to obtain data.

#### **3.2.1 Organization and Responsibilities**

Air monitoring activities will be performed primarily by Air Quality Program personnel. In some cases local air authority or contract personnel will assist with the operation of air monitoring stations in their area.

The title and responsibilities of key personnel are:

**Air Quality Program Manager**

- Management of the Air Quality Program

**Air Monitoring Coordinator**

- Washington Air Monitoring Work Group Chair
- Network Evaluation, Design, Budget, and Reports
- Special Project Evaluation, Design, Budget, and Reports
- Air Monitoring Equipment Amortization and Procurement Approval
- Station Installation and Operation Coordination and Status Assessment
- Site, Shelter and Utility Contracts

**Quality Assurance Coordinator**

- Air Monitoring Procedures and Training
- Quality Assurance Policies, Plans, and Procedures
- Quality Assurance Equipment Evaluation, Procurement and Acceptance Testing
- National Performance Audit Program Coordination
- Performance and System Audits
- Inter and Intra Laboratory Testing
- Data Validation
- Data Quality Assessment and Report

**Engineering and Technical Services Section Manager**

- Technical Assistance for Station Installation, Operation, and Maintenance
- Calibration and Quality Control Standards
- Air Monitoring Equipment Evaluation, Procurement and Acceptance Testing
- Air Monitoring Equipment Calibration
- Parts and Supplies Inventory
- Major Equipment Repair

**Regional Office Section Manager**

- Supervise Regional Station Operators
- Coordinate and Oversee Local Agency Monitoring

**Air Monitoring Station Operators**

- Station Site Selection (approval by Air Monitoring and Quality Assurance Coordinator required)
- Station Installation
- Station Operation
- Sample Collection
- Quality Control and Precision Checks
- National Performance Audits
- Routine Maintenance and Repair

### Information Management Supervisor

- Telemetry Operating Protocols, Training and Technical Assistance
- Telemetry Equipment Evaluation, Procurement and Acceptance Testing
- Telemetry Calibration and Quality Control
- Telemetry System Operation and Maintenance
- Air Monitoring Data Management
- Air Monitoring Data Analysis
- Air Monitoring Data Reports

Figure 1 represents the organizational structure of the areas of the Air Quality Program that are responsible for the activities defined above.

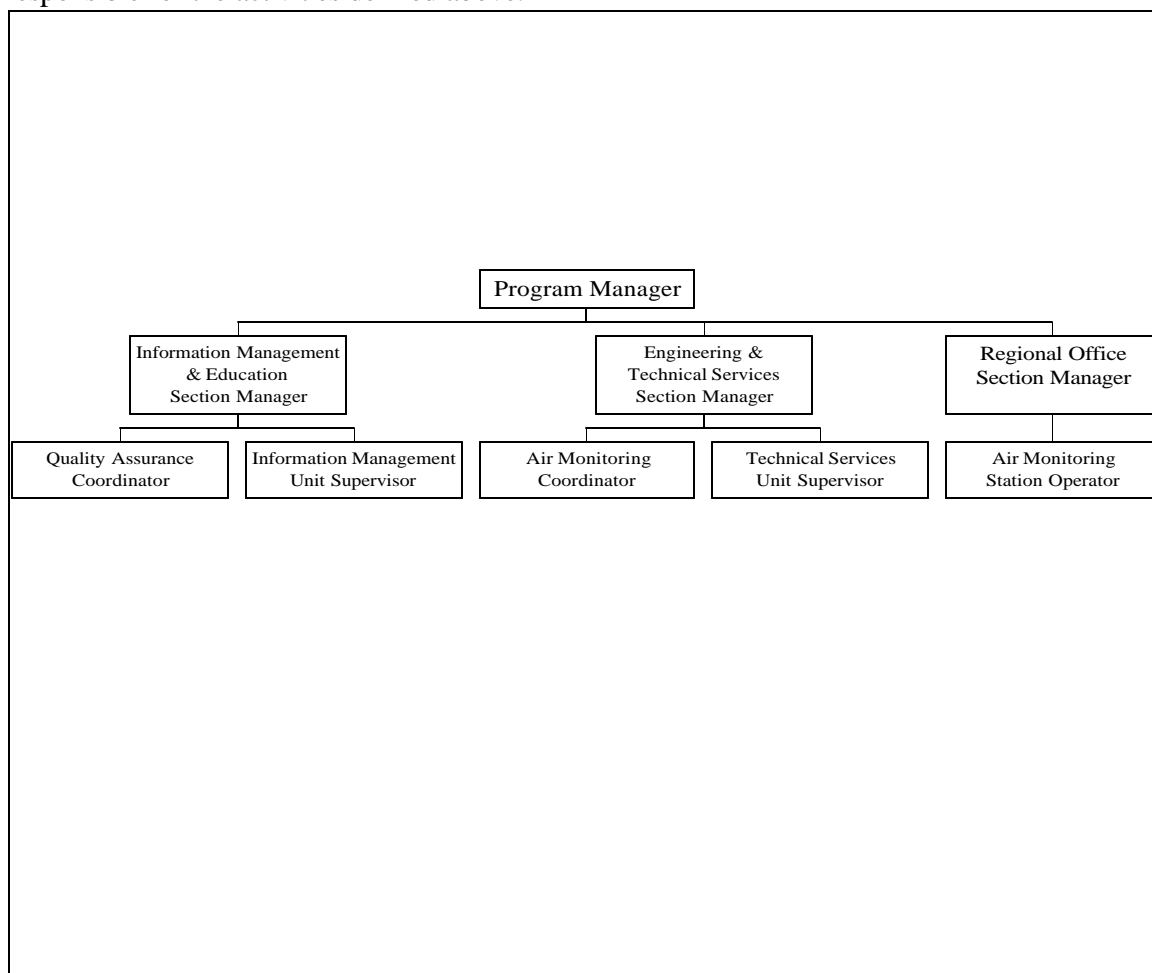


Figure 1 Organization Chart

### 3.3 Office of Air Quality Planning and Standards (OAQPS)

OAQPS is charged under the authority of the CAA to protect and enhance the quality of the nation's air resources. OAQPS sets standards for pollutants considered harmful to public health or welfare and, in cooperation with EPA's Regional Offices and the States, enforces compliance with the standards through state implementation plans (SIPs) and regulations controlling emissions from stationary sources.

The OAQPS evaluates the need to regulate potential air pollutants and develops national standards; works with State and local agencies to develop plans for meeting these standards; monitors national air quality trends and maintains a database of information on air pollution and controls; provides technical guidance and training on air pollution control strategies; and monitors compliance with air pollution standards

### **3.4 EPA Region 10**

EPA Regional Offices have been developed to address environmental issues related to the states within their jurisdiction and to administer and oversee regulatory and congressionally mandated programs. The major quality assurance responsibilities of EPA's Region 10 Office are the coordination of quality assurance matters at the Regional levels with the State and local agencies. This is accomplished by the designation of EPA Regional Project Officers who are responsible for the technical aspects of the program.

## **4 Problem Definition and Background**

### **4.1 Problem Statement and Background**

Between the years 1900 and 1970, the emission of six principal ambient air pollutants increased significantly. The principal pollutants, also called criteria pollutants, are: particulate matter (PM), sulfur dioxide (SO<sub>2</sub>), carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>), ozone (O<sub>3</sub>), and lead (Pb). In 1970 the CAA was signed into law. The CAA and its amendments provide the framework for pertinent organizations to protect air quality. This framework provides for the monitoring of these criteria pollutants by State and local organizations.

Air quality samples are generally collected for one or more of the following purposes:

- To judge compliance with and/or progress made towards meeting the NAAQS.
- To develop, modify or activate control strategies that prevent or alleviate air pollution episodes.
- To observe pollution trends throughout the region, including non-urban areas.
- To provide a database for research and evaluation of effects air pollution.

With the end use of the air quality samples as a prime consideration, various networks can be designed to meet one of six basic monitoring objectives listed below:

- Determine the highest concentrations to occur in the area covered by the network.
- Determine representative concentrations in areas of high population density.
- Determine the impact on pollution levels of significant source or source categories.
- Determine general background concentration levels.
- Determine the extent of regional pollutant transport among populated areas, and in support of secondary standards.

- Determine the welfare-related impacts in more rural and remote areas.

Washington State's monitoring network consists of three major categories of monitoring stations that measure the criteria pollutants. These stations are described below.

The State and Local Air Monitoring Stations (SLAMS) network consists of monitoring stations whose size and distribution is largely determined by the needs of State and local air pollution control agencies to meet their respective SIP requirements.

The National Air Monitoring Stations (NAMS) network is a subset of the SLAMS network with emphasis being given to urban and multi-source areas. In effect, they are key sites under SLAMS, with emphasis on areas of maximum concentrations and high population density.

The Special Purpose Monitoring Stations (SPMS) network provides for special studies needed by the State and local agencies to support their SIP's and other air program activities. The SPMS are not permanently established and can be adjusted easily to accommodate changing needs and priorities. The SPMS are used to supplement the fixed monitoring network as circumstances require and resources permit. If the data from SPMS are used for SIP purposes, they must meet all quality assurance (QA) and methodology requirements for SLAMS monitoring.

This Quality Assurance Plan focuses on the QA activities of the SLAMS, NAMS, and SPMS network and the objectives of this network, which include any sampler used for comparison to the NAAQS. Since there is more than one objective for this data, the quality of the data will be based on the highest priority objective, which is identified as the determination of violations of the NAAQS.

## **5 Project/Task Description**

### **5.1 Description of Work to be Performed**

As required by Washington State Law (Washington Administrative Code, Title 70, Chapter 173, Section 400-120, Monitoring), the Air Quality Program will conduct a continuous surveillance program to monitor the quality of the ambient atmosphere as to concentrations and movements of air contaminants.

To facilitate the protection of public health and welfare from the effects of air pollution, to evaluate the status of the State and National Ambient Air Quality Standards and to generate data for SIP activities, the Air Quality Program will monitor carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO<sub>2</sub>), ozone (O<sub>3</sub>), PM<sub>2.5</sub> (particulate matter with an aerodynamic diameter of 2.5 micrometers), PM<sub>10</sub> (particulate matter with an aerodynamic diameter of 10 micrometers), sulfur dioxide (SO<sub>2</sub>), total suspended particulate (TSP), visibility (B-scat) and meteorological conditions.

## 5.2 Field Activities and Measurements

Field activities and measurements are defined in the Air Quality Program's Quality Assurance Policy and Procedure Manual.

## 5.3 Laboratory Activities

Laboratory activities in direct support of the Air Quality Program include gravimetric analysis for particulate are described in the Air Quality Program's Quality Assurance Policy and Procedure Manual.

## 5.4 Project Assessment Techniques

An assessment is an evaluation process used to measure the performance or effectiveness of a system and its elements. As used here, assessment is an all-inclusive term used to denote any of the following: audit, performance evaluation, management systems review, peer review, or inspection. Table 1 presents a schedule of these assessments. Section 18 discusses the details of these assessments.

**Table 1 Assessment Schedule**

Assessment Type	Assessment Agency	Frequency
Technical Systems Audit	EPA Region 10/WSDOE	1 every 3 years
Network Review	EPA Region 10/WSDOE	Annual
Data Qualifiers/Flags Review	WSDOE	Annual
SOP Review	WSDOE	every 3 years
Performance Evaluations	EPA Region 10	25% of sites per year/4 times per year.
Data Quality Assessment	WSDOE	Annual

## 5.5 Project Records

The Air Quality Program's Quality Assurance Policy and Procedure Manual establishes procedures for the timely preparation, review, approval, issuance, use, control, revision and maintenance of documents and records.

# 6 Quality Objectives and Criteria for Measurement Data

## 6.1 Data Quality Objectives (DQOs)

DQOs are qualitative and quantitative statements derived from the DQO Process that:

- Clarify the monitoring objectives.
- Define the appropriate type of data.

- Specify the tolerable levels of decision errors for the monitoring program.

By applying the DQO Process to the development of a quality system the Air Quality Program guards against committing resources to data collection efforts that do not support a defensible decision.

## **6.2 Clarify Monitoring Objectives**

The monitoring objectives for implementing the Air Quality Program are to:

- Determine ambient concentrations of criteria pollutants.
- Determine compliance with the NAAQS for the criteria pollutants.

## **6.3 Define Appropriate Type of Data**

In order to accomplish the monitoring objectives, the appropriate type of data needed is defined by the NAAQS. For criteria pollutants, compliance with the NAAQS is determined by specific measurement requirements. The measurement system is designed to produce criteria pollutant concentration data that are of the appropriate quantity and quality necessary to determine compliance with these standards.

## **6.4 Specify Tolerable Levels of Decision Errors for the Monitoring Program**

DQOs for criteria pollutant monitoring are based on data requirements of the decision maker(s). Regarding the quality of the measurement system, the objective is to control precision and bias in order to reduce the probability of decision errors.

## **6.5 Measurement Quality Objectives (MQOs)**

Once a DQO is established, the quality of the data must be evaluated and controlled to ensure that it is maintained within the established acceptance criteria. MQOs are designed to evaluate and control various phases (sampling, preparation, and analysis) of the measurement process to ensure that total measurement uncertainty is within the range prescribed by the DQOs. MQOs can be defined in terms of Precision, Bias, Representativeness, Detectability, Completeness and Comparability.

Various parts of 40 CFR have identified acceptance criteria for some of these attributes as well as U.S. EPA Quality Assurance Guidance Document. More detailed descriptions of these MQO's and how they will be used to control and assess measurement uncertainty are described in the Air Quality Program's Quality Assurance Policy and Procedure Manual.

# **7 Training**

Air monitoring personnel will be recruited and screened to ensure they are experienced and qualified.

Air monitoring personnel will receive sufficient training in their appointed jobs to contribute to the reporting of complete and high quality data. Workshops and courses will be provided by Quality Assurance. Primary responsibility for training will rest with the individual's supervisor.

Prior to installation of new equipment, station operators will attend training sessions where Technical Services Unit personnel will familiarize them with the operation, calibration and maintenance of the new equipment.

As the lead organization, the Air Quality Program will provide this standardized training to all air monitoring personnel (including local air pollution agency Station Operators).

## **8 Documentation and Records**

The Air Quality Program's Quality Assurance Policy and Procedure Manual describes document and records procedures.

As indicated in 40 CFR Part 58, the Air Quality Program shall submit to the EPA Administrator, through the Region 10 Office, an annual summary report of all the air quality monitoring data from monitoring stations designated as SLAMS. The report will be submitted by July 1 of each year for the data collected from January 1 to December 31 of the previous year.

The Air Quality Program Manager will certify that the annual summary is accurate to the best of his/her knowledge. This certification will be based on the various assessments and reports performed by the organization.

## **9 Sampling Design**

This Section describes the relevant components of the SLAMS monitoring network. The network design components comply with the regulations stipulated in 40 CFR Part 58 Section 58.13, Appendix A, and Appendix D and further described in the Air Quality Program's Quality Assurance Policy and Procedure Manual.

## **10 Sampling Methods**

This Section describes the measurement methods for determining compliance with the primary and secondary national ambient air quality standards for the criteria pollutants specified in 40 CFR Part 50.

### **10.1 Sample Collection and Preparation**

Sample collection and preparation are detailed in the Air Quality Program's Quality Assurance Policy and Procedure Manual.

## 10.2 Sample Set-up

The Air Monitoring Coordinator will coordinate the installation of each station. The Technical Services Unit will provide the appropriate equipment and technical assistance to the Station Operators with the installation.

Representativeness will be achieved by adhering to the specifications in 40 CFR 58, Appendix D, "Network Design for State and Local Air Monitoring Stations (SLAMS) and National Air Monitoring Stations (NAMS)" and Appendix E, "Probe Siting Criteria for Ambient Air Quality Monitoring".

Automated analyzers will be maintained in temperature controlled environments at  $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$ .

## 10.3 Field Measurement System

**Pollutant Concentration and Flow Rate Standards.** Utilizing the procedures specified in 40 CFR 58, Appendix A, "Quality Assurance Requirements for State and Local Air Monitoring Stations" and EPA's Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II and IV, the Technical Services Unit will maintain the calibration and quality control standards employed in the CO, Pb, NO<sub>2</sub>, O<sub>3</sub>, PM<sub>2.5</sub>, PM<sub>10</sub>, SO<sub>2</sub>, TSP, B-scat and meteorological monitoring systems.

**Carbon Monoxide.** The procedures in 40 CFR 50, Appendix C, "Measurement Principle and Calibration Procedure for the Measurement of Carbon Monoxide in the Atmosphere (Non-Dispersive Infrared Photometry)", the EPA's Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Section 2.6, "Reference Method for the Determination of Carbon Monoxide in the Atmosphere (Non-Dispersive Infrared Photometry)", and the Washington State Department of Ecology Air Quality Program's "Carbon Monoxide Procedures" will be used in measuring carbon monoxide.

**Lead.** The Procedures in 40 CFR 50, Appendix G, and EPA's Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Section 2.8 "Reference Method for the Determination of Lead in Suspended Particulate Matter Collected From Ambient Air" will be used in measuring atmospheric lead.

**Meteorological.** The Procedures in EPA's Quality Assurance Handbook for Air Pollution Measurement Systems, Volume IV, "Meteorological Measurements" and the Washington State Department of Ecology Air Quality Program's "Meteorological Monitoring Procedures" will be used in measuring meteorological parameters.

**Nephelometer.** The Washington Department of Ecology Nephelometer Procedures will be used in measuring nephelometer back scattering data.

**Nitrogen Dioxide.** The Procedures in 40 CFR 50, Appendix F, "Measurement Principle and Calibration Procedure for the Measurement of Nitrogen Dioxide in the Atmosphere (Gas Phase Chemiluminescence)" and EPA's Quality Assurance Handbook for Air Pollution Measurement

Systems, Volume II, Section 2.3 "Reference Method for the Determination of Nitrogen Dioxide in the Atmosphere (Chemiluminescence)" will be used in measuring nitrogen dioxide.

**Ozone.** The Procedures in 40 CFR 50, Appendix D, "Measurement Principle and Calibration Procedure for the Measurement of Ozone in the Atmosphere", EPA's Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Section 2.7, "Reference Method for the Determination of Ozone in the Atmosphere (Chemiluminescence)" and the Washington State Department of Ecology Air Quality Program's "Ozone Monitoring Procedures" will be used in measuring ozone.

**Particulate Matter as PM<sub>2.5</sub>.** The Procedures in 40 CFR 50, Appendix L, "Reference Method for the Determination of Fine Particulate Matter as PM<sub>2.5</sub> in the Atmosphere" and EPA's Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Section 2.12, "Monitoring PM<sub>2.5</sub> in Ambient Air Using Designated Reference or Class I Equivalent Methods", and the Washington State Department of Ecology Air Quality Program's "Draft PM<sub>2.5</sub> Monitoring Procedures" will be used in measuring PM<sub>2.5</sub>.

**Particulate Matter as PM<sub>10</sub>.** The Procedures in 40 CFR 50, Appendix J, "Reference Method for the Determination of Particulate Matter as PM<sub>10</sub> in the Atmosphere", EPA's Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Section 2.11, "Reference Method for the Determination of Particulate Matter as PM<sub>10</sub> in the Atmosphere (High Volume PM<sub>10</sub> Sampler Method)", and the Washington State Department of Ecology Air Quality Program's "High Volume PM<sub>10</sub> Volumetric Flow Controlled Procedures" will be used in measuring PM<sub>10</sub>.

**Sulfur Dioxide.** EPA's Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Section 2.9, "Equivalent Method for the Determination of Sulfur Dioxide in the Atmosphere (Fluorescence)" and the Washington State Department of Ecology Air Quality Program's "Sulfur Dioxide Procedures" will be used in measuring sulfur dioxide.

**Suspended Particulate Matter.** The Procedures in 40 CFR 50, Appendix B, "Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere" and EPA's Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Section 2.2, "Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere (High Volume Method)" will be used in measuring particulate.

## 10.4 Sampling Equipment, Preservation, and Holding Time Requirements

The Air Quality Program's Quality Assurance Policy and Procedure Manual addresses the requirements needed to prevent sample contamination, the volume of air to be sampled, how to protect the sample from contamination, temperature preservation requirements, and the permissible holding times to ensure against degradation of sample integrity.

## 10.5 Sample Contamination Prevention

The Air Monitoring network has rigid requirements for preventing sample contamination. These requirements are discussed in the Air Quality Program's Quality Assurance Policy and Procedure Manual.

## 11 Sample Custody

Due to the potential use of air monitoring data for comparison to the NAAQS the sample custody procedures as discussed in EPA's Air Monitoring QA Guidance 2.12 will be followed.

## 12 Analytical Methods

The Air Quality Program's Quality Assurance Policy and Procedure Manual documents the use of laboratory methods to provide analytical support used in the air monitoring network. This analysis is conducted by Ecology's Manchester Laboratory.

## 13 Quality Control Requirements

The quality control procedures specified in 40 CFR 58, Appendix A and EPA's Quality Assurance Handbook for Air Pollution Measurement Systems, Volumes II and IV will be utilized to check the quality of the data. Quality control activities, including precision checks, will be documented on the chart and station logbook. The manual weekly low span check is synonymous with the precision check. The frequencies, control limits, and corrective actions associated with these checks are presented in Table 2.

**Table 2 - Quality Control Checks**

Parameter	Check	Control Limit	Corrective Action
<b>Automated CO, NO<sub>2</sub>, O<sub>3</sub>, SO<sub>2</sub> &amp; Neph.</b>	<b>Automatic Daily Span</b>		
	Low	> ±7%	Rectify Problem
	High	> ±10%	Invalidate Data
	<b>Manual Weekly Span</b>		
	Low	> ±7%	Rectify Problem
	High	> ±10%	Invalidate Data
	<b>Automatic Daily &amp; Manual Weekly Zero Checks</b>	> ±1% of Full Scale > ±2% of Full Scale	Rectify Problem Invalidate Data
	<b>Weekly Chart Time Check</b>	> ±10 Minutes	Adjust Chart to Correct Time

Parameter	Check	Control Limit	Corrective Action
<b>Manual Pb, PM<sub>10</sub> &amp; TSP</b>	<b>Monthly</b> Flow Check	$> \pm 7\%$ $> \pm 10\%$	Re-calibrate Invalidate Data
<b>PM<sub>2.5</sub></b>	<b>Every 5<sup>th</sup> Sampling Day</b> Internal & External Leak Check	$> 80$ ml/min.	Rectify Problem, Flag Data
	<b>Monthly</b> One Point Flow Rate Verification	$> \pm 4\%$ $> \pm 10\%$	Rectify Problem, Perform Multi-point Calibration, Flag Data Rectify Problem, Perform Multi-point Calibration, Invalidate Data
	Pressure Verification	$> \pm 10$ mmHg	Rectify Problem, Perform Pressure Sensor Calibration, Flag Data
	Temperature Verification	$> \pm 4^{\circ}$ C	Rectify Problem, Perform Temperature Sensor Calibration, Flag Data
	Clock/Timer Verification	$> 1$ min/month	Rectify Problem
<b>PM<sub>2.5</sub></b>	<b>Annually</b> Flow Rate Multi-point Verification	$\pm 2\%$ of Transfer Standard	
	Temperature Sensor Multi-point Verification	$\pm 2\%$ of Transfer Standard	
	Pressure Sensor Verification	$\pm 10$ mmHg	
<b>Meteorological</b>	<b>Quarterly</b> Wind Speed	$> \pm 5\%$	Invalidate Data
	Wind Direction	$> \pm 3^{\circ}$	Rectify Problem
		$> \pm 5^{\circ}$	Invalidate Data
	Temperature	$> \pm 0.5^{\circ}$	Invalidate Data

## **14 Procurement, Acceptance Testing, and Maintenance Requirements for Instruments , Supplies and Consumables**

This section details the procedures used for procuring, inspecting, testing, and accepting instruments, supplies and consumables that directly or indirectly affect data quality. By having documented inspection and acceptance criteria consistency can be assured.

### **14.1 Procurement and Acceptance Testing of Equipment**

The Air Monitoring Coordinator will be responsible for identifying air monitoring equipment needs and approving equipment purchases. The following protocol will be used in procurement of air monitoring equipment:

- Equipment evaluation and selection. Prior to purchase, the equipment's performance will be evaluated and other users queried in regard to the performance, dependability and ease of operation.
- Purchase specifications. The purchase contract will state the performance specifications that insure only equipment of the desired quality is obtained, require a one year warranty, and indicate payment will not be made until the equipment has passed an acceptance test.
- Acceptance Testing. Prior to payment, the equipment will be tested to ensure that it meets the requirements listed in the purchase specifications. For analyzers, the minimum test consists of checking zero drift, span drift, voltage stability, temperature stability, and linearity. Acceptance test reports will be prepared and archived by the Technical Services Unit.

### **14.2 Maintenance of Equipment**

Utilizing the specifications in EPA's Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II and IV, preventive and remedial maintenance tasks, schedules, parts and supplies will be maintained by the Technical Services Unit.

The Station Operators are responsible for performing routine preventive and corrective maintenance. They will prepare maintenance reports that will be reviewed and archived by the Technical Services Unit.

Major maintenance and repair will be performed by the by the Technical Services Unit. For each criteria pollutant, specific frequency requirements and schedules are specified in the Air Quality Program's Quality Assurance Policy and Procedure Manual.

## **15 Instrument Calibration and Frequency**

The Air Quality Program's Quality Assurance Policy and Procedure Manual details instrument calibration, frequency and documentation requirements for each criteria pollutant.

## 16 Data Acquisition Requirements

This section addresses data not obtained by direct measurement from the Air Quality Program. This includes both outside data and historical monitoring data. Non-monitoring data and historical monitoring data are used by the Program in a variety of ways. Data obtained in this manner must comply with the requirements for data acceptance as outlined in the Air Quality Program's Quality Assurance Policy and Procedure Manual.

## 17 Data Management

This section addresses data management procedures used in support of the Air Quality Program. Specific details of data recording, processing, validation, assessment, transmittal, reporting, archiving and retrieval are discussed in the Air Quality Program's Quality Assurance Policy and Procedure Manual and in the following sections.

### 17.1 Data Recording

Air monitoring station reports (Site Masters) will be prepared by the Station Operators and revised when changes in the instrumentation or surrounding area occur. These reports will identify the station name, station number, date, time, operator, instrument identification, parameter, scale and units. Additionally, the report will document the station location, address, UTM coordinates, elevation, and probe location. These reports will be sent to the Quality Assurance Unit for review and to Data Management for processing and archiving.

Air monitoring equipment calibration reports will be prepared and archived by the Technical Services Unit.

The Station Operators will maintain station logbooks documenting operational and maintenance activities at the monitoring site. The logbook will be identified with the station name, station number, date, time, operator, instrument identification, parameter, scale and units. The log book will be used to document quality control checks (time, zero, span, precision, calibration, temperature, pressure, flow, etc.), maintenance, audits, equipment changes (span gas, permeation tubes, analyzer, recorder, pen, paper, probe, etc), and missing or invalid data. The logbooks will be reviewed by the Quality Assurance Unit and archived by the Technical Services Unit.

Charts documenting air monitoring data will be processed by the Station Operator, reviewed and archived by the Quality Assurance Unit. The charts will identify the station name, station number, date, time, operator, instrument identification, parameter, scale and units. The charts will be used to document quality control checks (time, zero, span, precision, calibration, temperature, pressure, flow, etc.), maintenance, audits, equipment changes (span gas, permeation tubes, analyzer, recorder, pen, paper, probe, etc), and missing or invalid data.

## 17.2 Data Validation

The following quality assurance and data validation processes will provide for data that meets the Program's quality assurance criteria.

Data loggers at the stations will automatically screen and flag data that does not meet the Program's quality assurance criteria. The Program Manager may authorize controlled access and limited use of the resulting unflagged and unvalidated data to the following:

- Local air pollution agencies for internal use, air quality index reporting and air pollution curtailment. The data cannot be published or released and must be labeled "Unvalidated for Internal Use Only".
- Educational institutions where it is demonstrated to the Program that real time data will enhance the educational process. The data cannot be published or released and must be clearly labeled "Unvalidated for Instructional Use Only".
- Industrial sources when under a legally enforceable order (compliance schedule or consent decree) to abate air emissions by a certain date, and the requirement for the real time data is demonstrated to the Program. Access will be granted only during the period of the order. The data cannot be published or released and must be labeled "Unvalidated for Internal Use Only".

This authorization will be by written order and will detail user obligations and restrictions.

Station Operator's will be responsible for the second phase of data validation. They will further screen, organize, and process the data and associated quality control information.

Finally, prior to the Department officially reporting or using the data to make decisions concerning air quality, air pollution abatement, or control, the data will be reviewed and certified as valid by the Quality Assurance Coordinator.

In order for the data to be considered valid the following conditions must be satisfied:

- The air monitoring instrumentation must be calibrated and operated according to standard operating procedures that have been approved by the Quality Assurance Coordinator.
- The data must be accompanied by back up charts which meet the specifications outlined in Section 13 of this Plan, and be identified with respect to station name, station number, date, time, operator, instrument identification, parameter, scale and units.
- The data must be bracketed by documented quality control checks (minimum of once per week for automated data, once per month for manual method data, and once per quarter for meteorological data) which substantiate that it meets the criteria in Section 13 of this plan.

Data which is reviewed and found to satisfy these criteria will be considered valid. Data that does not, will be invalidated back to the last valid quality control check and future data will be invalidated until it can be shown to meet the Program's tolerances.

Additionally, excessive zero drift, span drift, noise, timing errors, rise time, fall time, spiking, deterministic exceptions or statistical outliers will be cause to invalidate data.

### 17.3 Data Processing and Reporting

Automated data will be electronically transferred by telemetry from data loggers in the field to a central computer at Program headquarters. Manual method data will be coded into the computer from the laboratory reports. After the data is logged, edited and validated, Information Management will prepare quarterly and annual summary reports.

### 17.4 Data Quality Assessment

For each calendar quarter and year, the Quality Assurance Unit will prepare data precision, accuracy and completeness reports for the Program Manager and EPA.

**Automated and manual method precision:** The precision will be evaluated and reported employing the frequencies, procedures and calculations in 40 CFR 58, Appendix A, "Quality Assurance Requirements for State and Local Air Monitoring Stations (SLAMS)" .

**Automated and manual method accuracy:** Using results from the performance audits described in Section 7 of this plan and the calculations specified in 40 CFR 58, Appendix A, "Quality Assurance Requirements for State and Local Air Monitoring Stations (SLAMS)" , the accuracy will be evaluated and reported for each parameter.

**Data completeness:** The completeness of the data will be determined for each monitoring instrument and expressed as a percentage. Percent valid data will be a gauge of the amount of valid data obtained from a monitoring instrument, compared to the amount expected under ideal conditions (24 hours per day, 365 days per year). Exceptions will be analyzers which have a seasonal sampling period and manual method samplers that run either every day, every other day, every third day, or every sixth day.

### 17.5 Data Transmittal

Data transmittal occurs when data are transferred from one person or location to another or when data are copied from one form to another. Air quality data and information will be fully screened and validated and will be submitted directly to the AIRS-AQS via electronic transmission, in the format of the AIRS-AQS, and in accordance with the quarterly schedule.

### 17.6 Data Reduction

Data reduction processes involve aggregating and summarizing results so that they can be understood and interpreted in different ways. The ambient air monitoring regulations require certain summary data to

be computed and reported regularly to U.S. EPA. Other data are reduced and reported for other purposes such as station maintenance.

## 18 Assessments and Response Actions

An assessment, for this Plan, is defined as an evaluation process used to measure the performance or effectiveness of the quality system, the establishment of the monitoring network and sites and various measurement phases of the data operation.

**Performance Audits.** During each calendar quarter, utilizing the procedures and calculations specified in 40 CFR 58, Appendix A, "Quality Assurance Requirements for State and Local Air Monitoring Stations (SLAMS)", the Quality Assurance Unit will audit at least 50% of the operating automated analyzers and manual PM<sub>10</sub> samplers, so that each instrument will be audited at least twice per year. The manual PM<sub>2.5</sub> samplers will be audited once every quarter. Ecology's Manchester laboratory will perform Pb analytical measurement audits.

The Quality Assurance Unit will audit the accuracy of meteorological data at approved sites once per year using the methodology prescribed in EPA's Quality Assurance Handbook for Air Pollution Measurement Systems, Volume IV, "Meteorological Measurements".

**Systems Audits.** The systems audit is an on-site review and inspection of the entire ambient air monitoring program to assess its compliance with established regulations governing the collection, analysis, validation, and reporting of ambient air quality data. A systems audit will be performed annually by the Quality Assurance Coordinator. To provide uniformity in the evaluation, the criteria and procedures specified in EPA's Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Section 2.0.11 will be applied.

**Corrective Actions.** Section 13 illustrates the quality control checks, control limits and corrective actions planned for each parameter.

In addition, a Data Disposition Request (DDR) may be issued by Quality Assurance when their review of the data indicates:

- An instrument is operating outside of the Program's tolerances,
- corrective action is required, or
- documentation is not adequate to evaluate the quality of the data.

The Data Disposition Request (DDR) is a request for quality control information when data validity is questionable or corrective action when the instrumentation is out of tolerance. The Station Operator will investigate the questionable data, document the problem, perform corrective actions as appropriate and respond in writing to the Quality Assurance Unit.

The Quality Assurance Unit will make the final decision to accept or delete the data. In the absence of a response from the Station Operator, the questionable data will be invalidated back to the last valid quality control check and future data will be invalidated until it can be shown to meet the Program's tolerances.

## **19 Reports to Management**

The Quality Assurance Coordinator will prepare quarterly Air Monitoring Data Quality Assessment Reports that describe data quality in terms of precision, accuracy and data completeness. This report also is intended to alert the Air Quality Management Team, local agencies and Station Operators of data quality problems, to propose viable solutions to problems and to procure necessary additional resources.